5.0 REGULATORY REQUIREMENTS

This chapter discusses air toxics rules under the CAA, local air toxics rules, and proposed global warming legislation.

5.1 SUMMARY OF APPLICABLE REGULATIONS

Regulations affecting LFG management are addressed under various legislation including:

- the RCRA which regulates solid waste management such as the landfill itself,
- the CAA which regulates air emissions, and
- the Clean Water Act (CWA) which regulates discharges of water such as LFG condensate.

In addition to these federal regulations, similar state or local regulations may apply. A brief summary of potential regulations applicable to LFG management follow.

5.2 RCRA REGULATIONS

5.2.1 40 CFR 258

Under RCRA Subtitle D authority, rules were promulgated October 9, 1991 which described minimum federal criteria for MSW landfills. Part 258 of that rule was also co-promulgated under the authority of the CWA. RCRA regulates LFG from MSW landfills under 40 CFR Part 258 which states that owner/operators of NSW landfills must ensure that the concentration of CH_4 gas generated by the facility does not exceed 25 percent of the LEL for CH_4 in facility structures (excluding gas control or recovery system components) or the LEL at the facility property boundary. The owner/operators must also implement a routine CH_4 monitoring program with at least a quarterly monitoring frequency.

Section 258 additionally requires owners/operators of MSW units to comply with applicable requirements of the State Implementation Plans (SIPs) developed under Section 110 of the CAA.

5.2.2 40 CFR 261

Additional RCRA regulations pertaining to characterizing or managing hazardous wastes may apply where a landfill site generates gas condensate if the condensate is managed or disposed of as a waste. The condensate may be considered a hazardous waste unless testing demonstrates that none of the characteristics of ignitability, corrosivity, reactivity, or toxicity are present in accordance with EPA analytical methods.

Condensate may also be a hazardous waste if it is specifically listed as a waste in 40 CFR Subpart D. Listed wastes may be from non-specific sources (F001-F012, F019-F028, F032, F034-F035, F037 and F039) such as spent non-halogenated solvents (FOOS) or from specific sources (K00l-K151) such as spent carbon from treatment of wastewater containing explosives (K045). Listed wastes also include commercial chemical products or manufacturing intermediates which are identified as acute hazardous wastes (P001-P022), i.e., tetraethyl lead (P110) or which are identified as toxic wastes (U00l-U248),i.e., benzene (U019). In general, landfill gas condensate would not be considered as a listed waste.

Due to substantial water content, condensate is generally not corrosive (pH less than 2 or greater than or equal to 12.5 and a steel corrosion rate of 6.35 mm per year) or reactive (contains reactive sulfides or cyanides, reacts violently with water or is capable of detonation). Condensate may be ignitable (flash point less than 140^{0}F) if sufficient material has accumulated to separate into an aqueous phase and a hydrocarbon phase (0.5 to 5% of the total volume). Condensate in an emulsified state is not likely to be ignitable. Condensate would be considered toxic if the concentrations of listed contaminants exceed regulatory limits after a leachate preparation.

If testing demonstrates that condensate is characteristically a hazardous waste, the Universal Treatment Standards (UTS) may be applicable. The required treatment standards for these wastes must be met and the treater has the option of disposing of the treated wastes in a Subtitle C or Subtitle D facility. Waste derived from a listed waste cannot be disposed of at a subtitle D facility unless formally delisted.

5.3 CAA REGULATIONS

Since passage of the Federal CAA in 1970, many rules and regulations have been adopted that could potentially affect LFG operations. The applicability of these rules and regulations are governed by factors such as the implementation schedule of the rule, size of the facility, the equipment and type of operations conducted at the site, and the emissions from these operations. Potential applicable regulations include:

- New Source Performance Standards (NSPS),
- National Emission Standards for Hazardous Air Pollutants (NESHAPS),
- Title III of the CAA Amendments (CAAA), and
- Title V of the CAAA.

Each of these are described in more detail in the following sections.

5.3.1 NSPS

The primary rules affecting LFG operations from the 1970 CAA are the NSPS. In general, these regulations apply to municipal landfills and require the collection and control of CH_4 and NMOC, collectively called "LFG."

The NSPS rules apply to municipal landfills and are addressed in 40 CFR Parts 51, 52, and 60. Proposed rules were published in the Federal Register on May 30, 1991 with additional data and information on changes in EPA's modeling methodology were published in draft form on June 21, 1993. The

proposed standards are scheduled for promulgation in September 1994 but have not been promulgated at the time of the preparation of this document.

The proposed rule would required LFG emission control at landfills that:

- receive MSW,
- received waste after November 8, 1987,
- exceed a maximum design capacity of 100,000 metric tons (Mg) of in-place refuse, and
- exceed a maximum NMOC emission rate of 150 Mg per year.

To avoid installation of an LFG control system, the landfill must demonstrate that the emission limit would not be exceeded. This demonstration requires the calculation of the NMOC emission rate by:

- performing a desktop calculation using the EPA LFG emissions model with prescribed default values (Tier 1),
- determining NMOC emissions using EPA Test Method 25C (Tier 2), and
- performing a pump test program to estimate the generation rate (k) for use in the model using EPA method 2E (Tier 3).

If landfill emissions exceed 150 Mg/year, the facility can opt to install controls after each tier or can proceed to the next tier testing requirements. Recalculation of emission rates for facilities which are exempt from controls must be performed at intervals specified in the regulations.

The proposed standards for new landfills are that the best demonstrated technology (BDT) will reduce emissions from new landfills emitting 150 Mg/yr of NMOC or more with:

- a well-designed and well-operated gas collection system, and
- a control device capable of reducing NMOC in the collected gas by 98 weight-percent.

The proposed guidelines for existing landfills are that BDT will reduce emissions of existing landfills emitting 150 Mg/yr of NMOC or more with the same collection and control devices as required for new landfills. A collection system would:

- handle the maximum gas generation rate,
- incorporate a design capable of monitoring and adjusting the operation of the system,
- collect gas effectively from all areas of the landfill that warrant control, and
- expand by the addition of further collection system components to collect gas from new areas of the landfill as they require control.

The control device is an open flare capable of reducing NMOC emissions by 98 weight-percent. The proposed standards and guidelines also specify additional monitoring and reporting requirements.

After promulgation of the NSPS for municipal landfills, compliance with the guidelines for collection and control systems is required within 3 years from the time of promulgation of state regulations. The 3-year time period allows 90 days for the initial report; 2½ years for further site specific testing (if elected by the owner or operator); preparation and review of a collection system design plan; installation of the collection and control system; and 90 days for a performance test. Landfills that may already have collection and control systems

in place may not require the 3 years to bring their systems in to compliance.

To comply with NSPS for municipal landfills, the design and construction of new landfills which meet the applicability criteria must include the gas collection and control requirements defined in the rules. Facilities should evaluate the potential for including energy recovery in the design of new LFG control systems.

5.3.2 NESHAPs

The NESHAPs, promulgated under the Federal CAA (40 CFR Part 61 and 63) may potentially affect LFG operations at industrial sites although NESHAPs have not yet been proposed for LFG operations or solid waste landfills. NESHAPS have been established for benzene, vinyl chloride, asbestos, beryllium, coke oven emissions, inorganic arsenic, mercury and radionuclides. Of these, only asbestos currently has a section in its NESHAPS dealing with waste disposal. In the future, new NESHAPS may be promulgated which could affect other materials accepted by landfills.

5.3.3 Title III

Title III of the CAAA completely overhauled the existing hazardous air emission program. Title III includes a listing of Hazardous Air Pollutants (HAPs), the development and promulgation of Maximum Achievable Control Technology (MACT) standards, and the assessment of residual risk after the implementation of MACT.

Title III shifts its focus from a pollutant-by-pollutant basis to a service category basis. EPA was required to publish a list of major source categories and subcategories. The December 3, 1993 Federal Register published the Categories of Sources of Hazardous Air Pollutants and Regulation Promulgation Schedule by Industry Group and Source Category. The schedule date for the category of municipal landfills (under the Waste Treatment and Disposal Group) is November 15, 2000.

5.3.4 Title V

5.3.4.1 Title V Overview

EPA intends to use the Title V permits as a central mechanism to handle emissions constraints, monitoring data needs, compliance schedules, fee payments, and other conditions associated with the issuance, compliance and enforcement of operating permits. Title V established procedures and requirements for permitting of several source categories, including sources of hazardous air pollutants.

Regulations pursuant to this Title will require the landfill to consolidate the source's regulatory requirements into a single operating permit. Regulatory requirements relevant to landfill operations that must be included in the Title V permit include:

- Title I Non-attainment Status,
- Title III Air Toxics,
- Title VII Enforcement and Compliance,
- State Permit Programs, and
- Existing SIPs and Federal Implementation Plans (FIP).

5.3.4.2 Title V Applicability

Title V of the CAAA requires states to develop an air permitting program that conforms to requirements of the CAAA. The facility operating permit will be valid for five years. This requirement to prepare an operating permit is triggered by any of the following requirements:

- Emission rates of criteria pollutants of 100 tons per year for attainment areas (Triggers for non-attainment areas are lower and are based on attainment status).

- Emission rates of toxic pollutant of 25 tons per year combined or 10 tons per year of any one toxic compound.

- Facilities subject to NSPS or NESHAPS.

- Facilities subject to Title IV- Acid Rain provisions.

While the NSPS requirements for landfills have not been finalized at this time, it is likely that landfill operations will trigger the NSPS and hence subject the facility to the Title V operating permit program.

5.3.4.3 Title V Schedule

Title V operating permit submission is dependent on the approval by the EPA of state Title V programs and the implementation schedules defined in the state programs. State program proposals were due to the EPA by November 15, 1993 and the EPA must accept or reject the state proposal by November 15, 1994. Facilities will be required to submit their initial Title V Operating Permit Applications within 12 months after EPA's approval of a state permit. States are required to act on at least one-third of these permit applications each during a three year phase. The facility should review the applicable state Title V program to determine specific schedule requirements.

5.3.4.4 Title V Compliance

To comply with Title V regulations, landfill operators must check with their lead agency enforcing the Title V program to understand the compliance requirements and schedule for the program and submit a complete application prior to the specified deadline. In general, to comply with Title V, a landfill owner/operator must:

- Understand the requirements of the state program, including monitoring requirements and emission inventory protocols;

- Review all applicable federal, state and local rules and regulations relevant to landfill operations;

- Review the compliance status of all equipment at the facility;

- Prepare an emissions inventory based on defensible emission factor or source test data; and

- Prepare an application package meeting specific state requirements and utilizing specific state forms.

5.4 SECONDARY AIR EMISSIONS

Control devices used to reduce landfill air emissions can be expected to generate secondary air emissions of NO_x, SO_2, CO, PM, and $C0_2$. Table A-6 summarizes the secondary air emissions from various control techniques. From the narrow perspective, emissions of PM, SO_2, NO_x, CO, CO_2, and HCl at the landfill site may be increased due to operation of the control device. For landfill energy recovery devices such as gas turbines and internal combustion engines, the energy recovered is expected to reduce local or regional electric utility power generation. Since emissions from combusting LFG are less than combustion of coal at utility generating plants per unit of energy, LFG recovery systems could actually reduce emissions.\

5.5 CWA REGULATIONS

Under the CWA, if LFG condensate is disposed of by treatment and effluent discharge to a waterway, discharge permits will be required and stringent effluent quality may be required to meet a state's water quality standards. Effluent analyses required for all discharge permits includes:

- Biochemical Oxygen Demand (BOD),
- Chemical Oxygen Demand (COD),
- Total Organic Carbon (TOC),
- Total Suspended Solids (TSS),
- Ammonia (as N),
- Temperature,
- pH, and
- Flow.

Other analyses may be required if other pollutants are expected to be present. Permittees may also be required to test their discharge for toxicity.

Table A-6
Secondary Air Emissions from Control Techniques

Control Technique	Secondary Air Emissions (lb/MM scf LFG)[1]					
	NO_x	CO	HCl	CO_2	PM	SO_2
Enclosed flare	4.9	58	12	60,000	Trace	3.0
Incinerator	4.9	58	12	60,000	Trace	3.0
Boiler	70	17	12	60,000	Trace	3.0
Gas turbine	26.4	12.5	12	60,000	37	3.0
Internal combustion engine	111	259	12	60,000	Trace	3.0

[1]- Reference 3

If the condensate is disposed of by indirect discharge through a POTW, sewer effluent conditions will be imposed by the local POTW as regulated by local ordinances or federal requirements.

5.6 STATE AND LOCAL REGULATIONS

Some states and local authorities have also adopted rules that impact LFG emissions. A comprehensive review of all state rules is outside the scope of the document but typical requirements of state programs include:

- Air toxics and NMOC monitoring,
- Air emissions inventories,
- Risk evaluations,
- LFG collection design requirements, and
- Emissions control design requirements.

As an example of a state program, the California regulatory program for landfills requires emissions testing and quantification, risk assessments, and in some cases risk reduction.

LFG management in non-attainment areas in California is regulated by the New Source Review (NSR) Best Available Control Technology (BACT) rule. BACT specifies control requirements for emissions of non-attainment pollutants for new or modified sources. The South Coast Air Quality Management District and several other air districts in California are subject to a FIP to achieve attainment of the Federal ozone standards. The FIP required landfills to control NMOC based on the proposed NSPS for municipal LFG. The FIP essentially accelerates the implementation of the municipal landfill NSPS for the affected regions.

The California program is comprehensive and exceeds the requirements of most other states at this time. However, design, monitoring, and reporting requirements under RCRA Subtitle D and The CAAA Title III and Title V will bring most states in line with California LFG management standards.

Experience from previous design works by the Corps of Engineers on military landfill-gas-collection system found that few of the federal regulations on air emission control were applied. Either the regulations will not directly apply or the landfill will not emit enough NMOC or air toxics to fall under federal regulations. It is the state in which the landfill is located will regulate the acceptable emissions to the air, hence the landfill emission control requirements, and gas collection control systems. The designer should, therefore, review the state regulations, and work with the state air regulators while designing a landfill gas collection and control system.

Some states provide little guidance to the designers as to what emission control requirements are. In this case, a well designed stack in an area with favorable meteorology will adequately protect public health and will not require control provided a dispersion modeling be conducted to prove protection of public health from point sources of toxic air emissions.

5.7 GLOBAL WARMING AGREEMENT

Effects of LFG which are now being debated include tropospheric ozone formation, stratospheric ozone depletion, air toxics, global climate change and acid rain. Through an international agreement on global warming, the U.S. has committed to stabilizing greenhouse gas emissions to 1990 levels by the year 2000. These emissions lead to the "greenhouse effect" which is caused by the buildup of $C0_2$. $C0_2$ allows light from the sun's rays to heat the earth but also prevents the loss of the heat. Currently, no federal regulations require landfills to reduce greenhouse gases emissions. However, in order to stabilize greenhouse gas emissions to 1990 levels, the U.S. must develop a program to reduce $C0_2$ emissions or to offset these emissions by planting trees. As landfills emit the greenhouse gases CH_4 and $C0_2$, it is anticipated that future regulations may be developed requiring emission reduction by energy recovery. Attempts to control CH_4 by combustion will increase the $C0_2$ emissions. However, combustion of CH_4 to provide energy will displace the corresponding amount of fossil fuel combustion for energy generation. This efficient use of LFG for energy recovery is described in the proposed NSPS for municipal landfills.